PHYSICS ASSIGNMENT – (MODULE - 1)

F.M - 100

Group-I

Each question carries 2 mark.

1. A simple pendulum performs simple harmonic motion about x = 0 with an amplitude a and time period T. The speed of the pendulum at x = a/2 will be _____.

a) (πa√3)/T **b) (πa√3)/2T** **c) πa/T** **d) $(3\pi^2 a)/T$**

2. The total energy of a particle performing simple harmonic motion depends on _____.

a) k, a, m **b) k, a** **c) k, a, x** **d) k, x**

3. A linear harmonic oscillator of force constant 2×10^6 N/m and amplitude 0.01m has a total mechanical energy of 160J. Its _____

a) Potential energy is 160 J **b) Potential energy is zero**

c) Potential energy is 100J **d) Potential energy is 120J**

4. The potential energy of a simple harmonic oscillation when the Particle is halfway to its end point is _____

a) 2/3 E **b) 1/8 E** **c) 1/4 E** **d) 1/2 E**

5. In a simple harmonic motion, when the displacement is one half the amplitude, what fraction of the total energy is kinetic?

a) ½ **b) ¾** **c) Zero** **d) 1/4**

6. A body executes simple harmonic motion with amplitude A. At what displacement from the mean position is the potential energy of the body one fourth of its total energy?

a) A/4 **b) A/2** **c) 3A/4** **d) Some another fraction of A**

7. The maximum velocity of a particle executing SHM represented by x = A sin(wt) occurs at

a) x = 0 **b) x = A** **c) x = -A** **d) x = A/2**

8. Example of weakly damped harmonic oscillator is

a) Dead beat galvanometer **b) Tangent galvanometer**

c) Balastic galvanometer **d) Discharge of a charged capacitor through a resistance**

9. The displacement of a simple harmonic motion doing oscillation when kinetic energy = potential energy (amplitude = 4cm) is?

a) 2√2cm **b) 2cm** **c) 1/√2 cm** **d) √2 cm**

10. Light waves are

(a) longitudinal waves **(b) transverse waves** **(c) both (a) and (b)** **(d) none of them**

Group-II

Each question carries 6 mark.

Question-1: What is coupled oscillation? Obtain the equation of motion in terms of normal co-ordinates for two oscillators of equal mass coupled with each other. [6]

Question-2: What is forced harmonic oscillation? Formulate the differential equation of a particle executing forced harmonic oscillation. Obtain the conditions for resonance. [6]

Question-3: Starting from expression for wave function, obtain the wave equation for a wave travelling along Z-direction. [6]

Question-4: Mention the changes occur in reflected and transmitted waves, when an incident wave meets at a rarer boundary. [6]

Question-5: Define the following terms for Damped oscillation

a) Relaxation time
b) Q-factor
c) Rate of energy loss

Question-6: What is Resonance? Give two examples. Obtain the condition for resonance and the maximum value of amplitude at resonance. [6]

Question-7: Show that the total energy of a particle executing SHM is constant. [6]

Question-8: Define Normal Co-ordinates. Mention its uses and write the expressions for Normal mode frequencies for two oscillators of equal mass coupled with each other. [6]

Group-III

Each question carries 16 mark.

Question-1: What is damped harmonic oscillation? Write its differential equation and obtain its solution. Explain the under damped, over damped and critically damped oscillation with graph and examples. [16]

Question-2: Discuss the theory of oscillation of two oscillators of equal mass connected with each other by means of a light spring and suspended from a rigid support with equal length of strings. [16]

Question-3: Define Forced Oscillation. Obtain the equation of motion for it. Write the solution defining each term. And find out the average energy and average power. [16]

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